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Fourth Experiment.—The rabbit used in the second experiment was again confined in the apparatus for twenty hours, then immediately killed and dissected. No change could be detected in the organs. The blood seemed to clot more rapidly than normally, and the arterial blood was of a brighter hue. The venous blood was also probably a very little changed in color.

Fifth Experiment.—Two bantam hens were placed in the apparatus under the same conditions as in the third experiment. They were kept there for six days and twenty-one hours. We had planned to continue the experiment a full week, but the oxygen supply became exhausted. We could not see that they were affected in the least at any time.

From these experiments, we feel justified in concluding that an atmosphere of oxygen produces no permanent excitation, and no unnatural sleep or unconsciousness, and is not destructive to animal life.

EFFECT UPON THE COMPOSITION OF THE SOIL OF CONTINUOUS CROPPING BY WHEAT.

BY J. T. WILLARD, EXPERIMENT STATION, MANHATTAN.

Read before the Academy December 28, 1900.

In the fall of 1880, Prof. E. M. Shelton, of the Kansas State Agricultural College, laid out an acre of land to be devoted to the continuous production of winter wheat, without fertilization or renovating treatment of any kind. This experiment was doubtless suggested by the famous plat at Rothamsted, England, which Lawes and Gilbert have kept under such conditions since 1844. Unfortunately the plat selected by Professor Shelton was situated so that the growth of the institution has seemed to compel the abandonment of the experiment. The plat also, having a rather pronounced slope, was not as well adapted to the purpose of the experiment as would be desirable.

The abandonment of the experiment having been determined upon, it seemed of interest to make analyses of the soil of the plat, and, for comparison, of that of the adjoining field, which has borne a variety of crops, though not in any regular rotation. For sampling these fields four spots were selected in each, and pits sunk to the depth of the proposed sampling. A prism of soil six inches square was then cut from the side of each and divided into four parts, representing, respectively, the first nine inches from the top, and three intervals below this of twelve inches each. Four samples were thus obtained from each field for each depth. These four samples were then intimately mixed to form a composite sample, which was carefully air-dried and subsampled for analysis.

The analyses were limited to determinations of the moisture, insoluble residue, potash, lime, nitrogen, and phosphoric acid. The accompanying table exhibits the results as calculated to a water-free basis:

TABLE showing (I) composition of soil at several depths, from field cropped in wheat continuously for eighteen years; and (II) that from an adjacent field that had borne a variety of crops during the same period. Results calculated to a water-free basis, and in percentages.

	0 to 9 ins.		9 to 21 ins.		21 to 33 ins.		33 to 45 ins.	
	I.	II.	I.	II.	I.	II.	I.	II.
Potash	0.720	0.656	0.584	0.716	0.653	0.631	0.615	0.694
Lime	0.750	0.686	0.740	0.722	0.733	0.611	0.811	0.826
Nitrogen	0.216	0.245	0.169	0.152	0.104	0.117	0.087	0.081
Phosphoric acid	0.107	0.140	0.044	0.092	0.017	0.053	0.028	0.061
Insoluble residue	83.948	83.107	81.524	80.723	84.335	83.004	85.281	84.216

The analyses show the soils in both plats to be well supplied with the essential constituents, with the exception of phosphoric acid. This, while about the average in plat II, seems to have become considerably depleted in the plat kept continuously in wheat.

It will be interesting in this connection to note the product of grain during the eighteen years that the experiment continued. The following figures are as published in bulletin No. 71 of the Experiment Station, excepting for the last year, which is from press bulletin No. 1. The year of harvest and the yield in bushels of grain are given:

1881	9.00	1887, winter-killed.		1893	11.65
1882	47.00	1888	30.31	1894	6.05
1883	28.19	1889	37.00	1895, winter-killed.	
1884	37.00	1890	22.90	1896	24.85
1885	12.30	1891	30.75	1897	4.43
1886, winter-killed.		1892	31.30	1898	9.77

The total yield for the eighteen years was 342.5 bushels, an average of nineteen bushels per acre. This period includes three years in which the crop was winter-killed, and two more in which it was partially winter-killed. The soil is an upland, and would be regarded as of only moderate fertility, in view of which the yield obtained must be regarded as quite satisfactory. It will be noticed that during the last third of the period the product was materially less than previously, but whether this is due to soil exhaustion or merely to exigencies of the season must be left undecided.

The analyses of soil given above were made for me by Mr. A. G. Adjemian.

SILICA CEMENT MORTARS.

BY W. TWEEDDALE, TOPEKA.

Read before the Academy, at McPherson, December 29, 1899.

Cement plaster, a product of Kansas extensively used instead of lime mortar for plastering the inside of buildings, has been fully described in the fifth volume of report of the University Geological Survey of Kansas. I desire in the same line to present to you, for your information, another Kansas product which gives promise of being even of greater value as a constituent of mortar; which, possessing hydraulic properties, combines economy in cost with adaptability to all classes of masonry or concrete construction, from the heaviest foundation to the finest statuary. In said report it is termed volcanic ash; it is found of different degrees of purity, in practically inexhaustible quantities in a number of places in Kansas; it consists of silica, nearly white in color, and under the microscope appears to be in thin, transparent scales, overlapping each other, instead of, as in the case of grains of sand, being rounded, irregular particles.

To understand the value of silica as an ingredient of cement mortar, it will be of interest and tend to clearness to explain the characteristics and distinguishing differences, not only between lime mortar and cement mortars, but also between cement mortars of different kinds. These differences are both chemical and physical.

Lime, as a constituent of lime mortar, is an oxide of lime manufactured from a carbonate of lime, as limestone, chalk, or marble, by driving off the carbonic acid by means of heat in especially prepared kilns. This lime, when slaked with